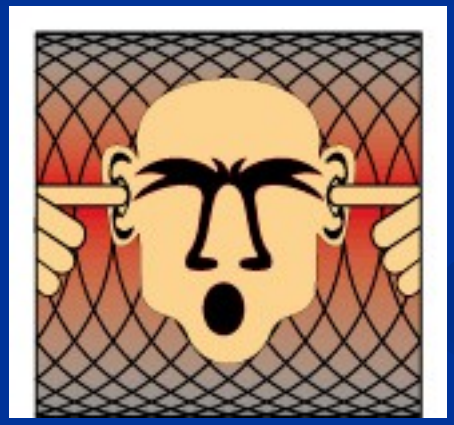
# Making Noise about Noise

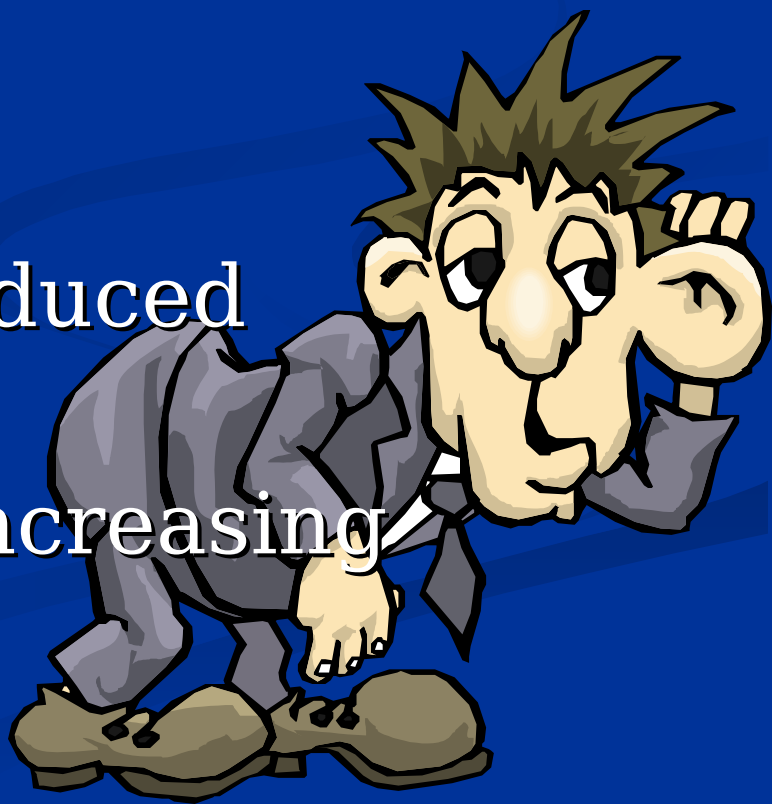


# Best Practices in Hearing Loss Prevention

**Zandra Walton, CIH**

# Why are we concerned?

- Less than 50% of workers who should use Hearing Protection do!!
- Hearing loss is the most common occupational illness.
- 30 million exposed
- 10 million  with noise induced hearing loss
- Hearing loss rates are increasing



# What does a 25 dB loss sound like?

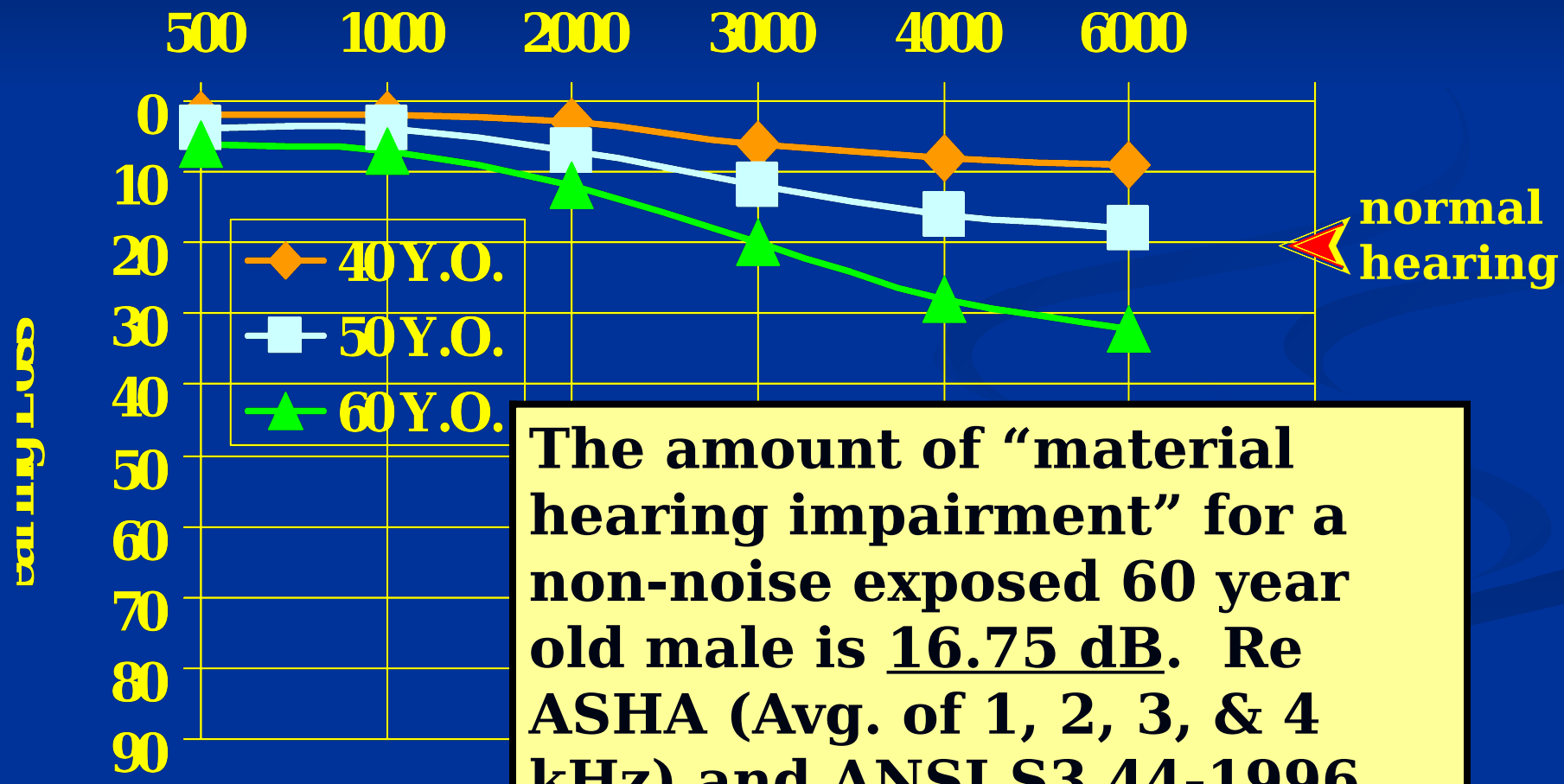
Won upon a time a itty mow when to vit a untry mow.

The untry mow live in a feel. Eee wuz lad to shee hi zittyfren.

WHAT???

# Common Perception

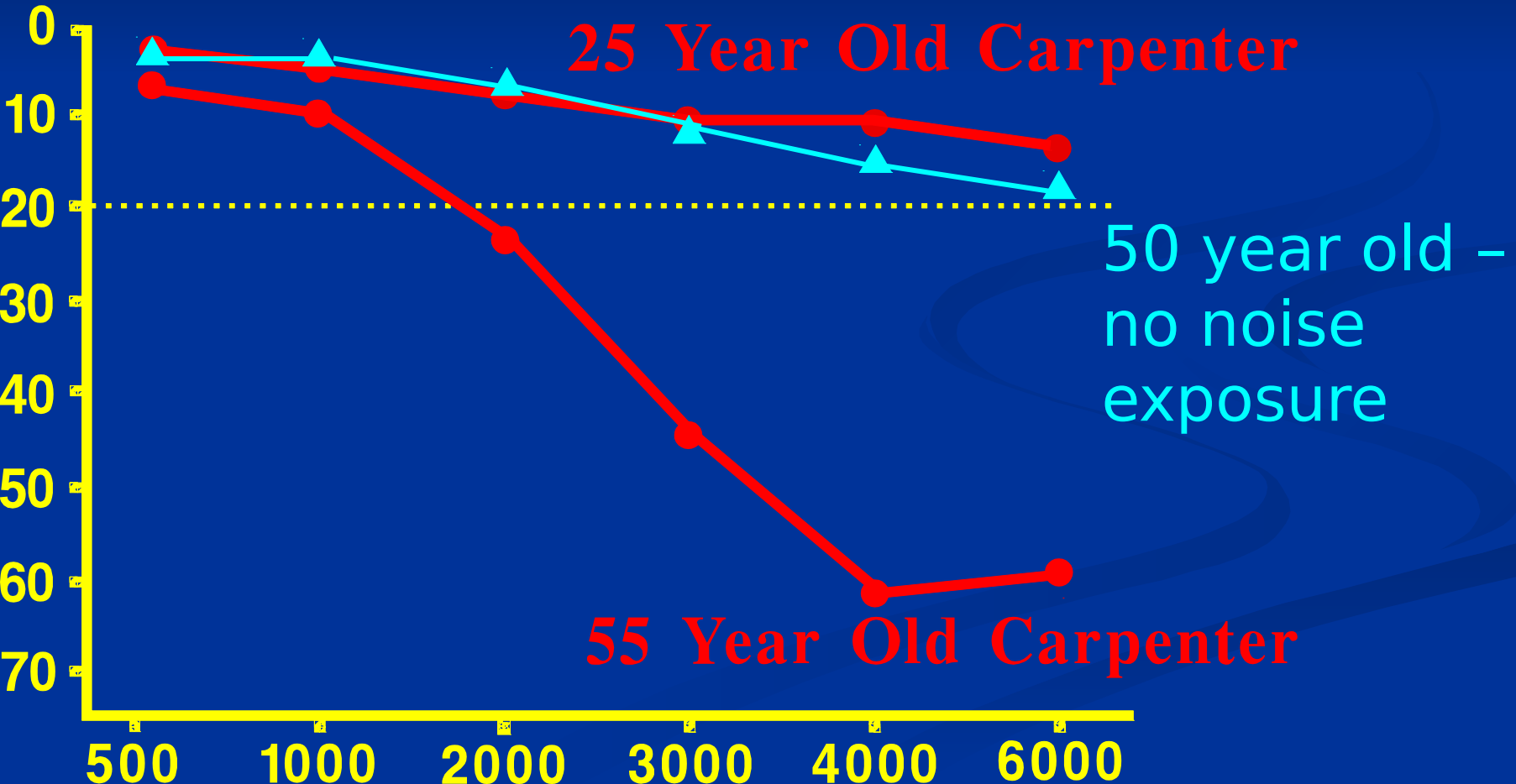
People lose their hearing anyway as they age……..



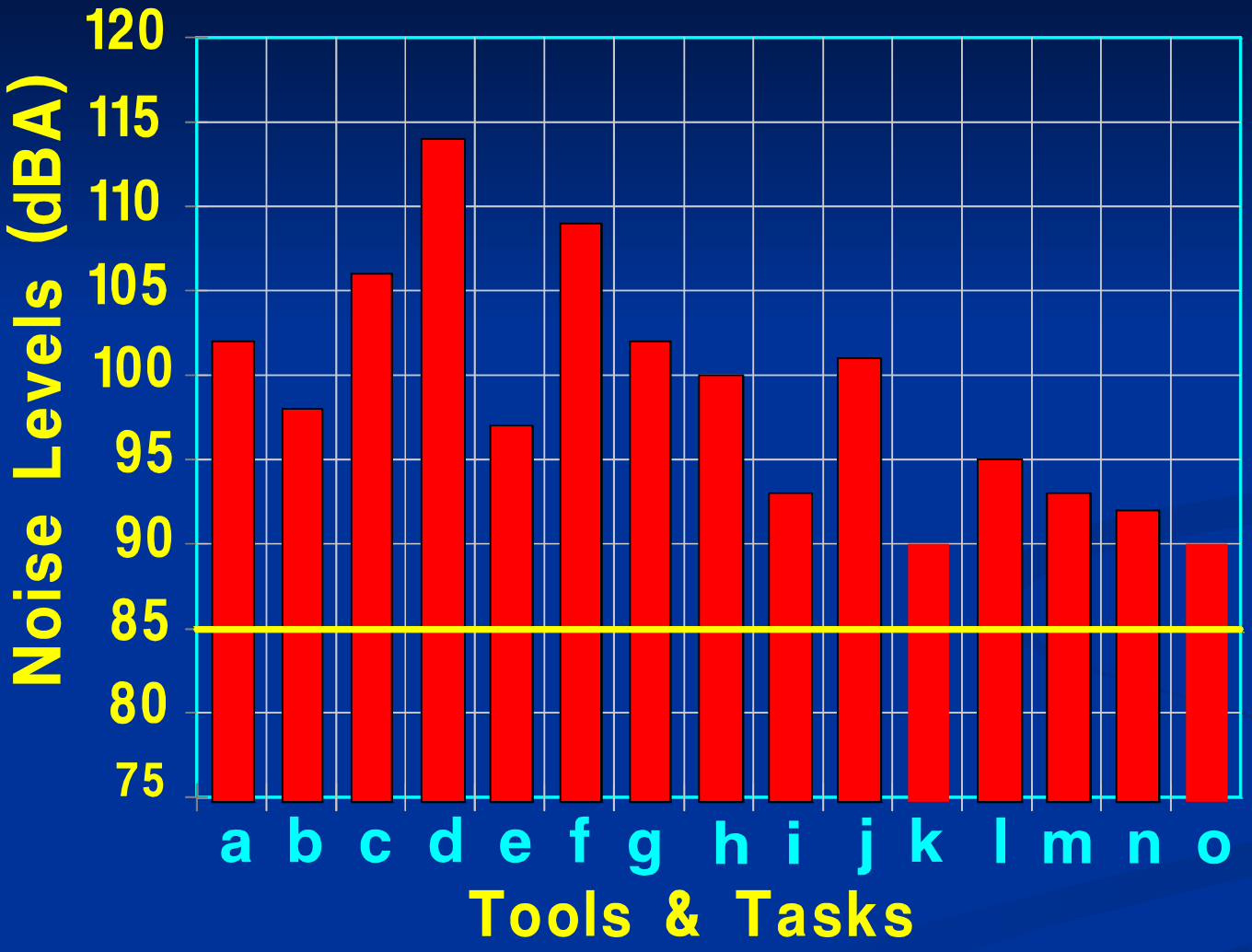

**The amount of "material hearing impairment" for a non-noise exposed 60 year old male is <u>16.75 dB</u>. Re ASHA (Avg. of 1, 2, 3, & 4 kHz) and ANSI S3.44-1996,**

# “I’m not exposed all day”

## The Average 25 Year Old Carpenter Has 50 Year Old Ears!



# Power Tool Noise Levels




**LEGEND**

a. mitre saw
b. hand drill
c. chop saw
d. hammer drill
e. metal shear
f. chain saw
g. impact wrench
h. skill saw
i. belt sander
j. tile saw
k. circular sander
l. router
m. planer
n. table saw
o. mortissing

# What is Noise?

- Noise is a physical energy that moves through the air like ripples in a pond
  - noise is directional
  - noise will bounce off walls and other objects

# Two Components of Noise

- Frequency
  - perceived as “pitch”
  - measured in hertz (Hz)
  - human ear most sensitive in the 1,000 to 4,000 range
    - speech frequency ranges
- Intensity
  - perceived as “loudness”
  - measured in decibels (dB)
  - “A” scale mimics the human ear
    - used for noise surveys

# Decibel Scale

- Decibel scale is logarithmic
- Every increase of 3 decibels is double the sound
  - 90 dB + 90 dB = 93 dB
  - 100 dB + 100 dB = 103 dB
- Every increase of 10 decibels multiplies the sound ten times

# How is Noise Measured?

- Sound level meter
  - instant noise readings
  - generally A scale used
    - mimics the human ear
- Noise dosimeter
  - measure a worker's noise exposure over a shift
    - daily dose of noise
  - very accurate

# Regulations - 29 CFR 1910.95

85 dBA - "Action Level"

- Hearing conservation program
- Engineering and/or administrative controls
- Annual audiograms
- Mandatory hearing protection when > 90 dBA
- Annual training
- Proper selection of hearing protective devices
- Recordkeeping

# OSHA HCA Exposure Times

| Noise Level | Allowable Exposure Time |
| --- | --- |
| 85 decibels | 8 hours |
| 90 decibels | 4 hours |
| 100 decibels | 1 hour |
| 105 decibels | 30 minutes |
| 110 decibels | 15 minutes |
| 115 decibels | 0 minutes |

# 29 CFR 1910.95 - Summary

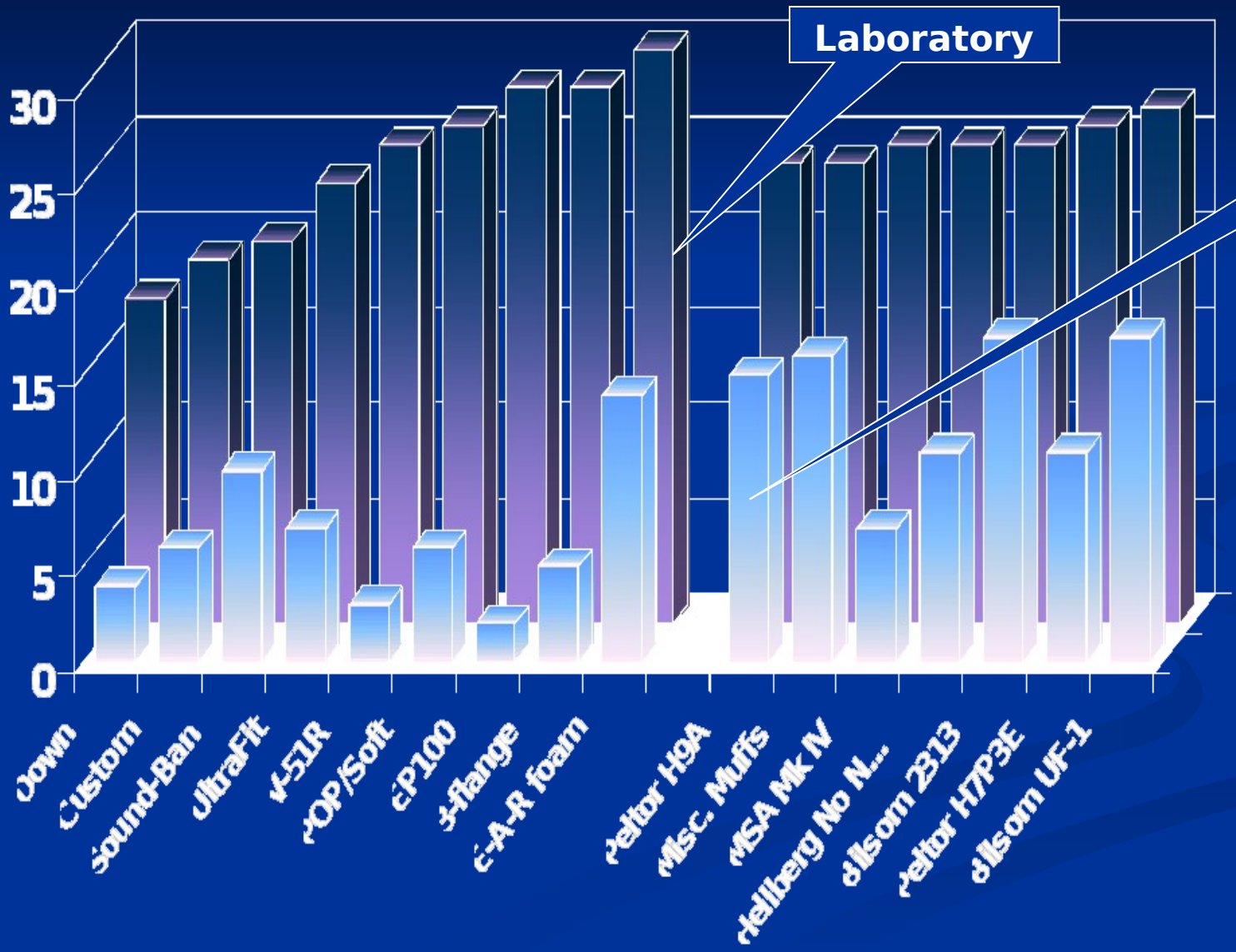
- Measure noise
- Measure hearing
- Use HPD

So what's wrong with that?

# Does the Standard Protect Workers?

- 3% of people exposed to 80 dBA noise levels develop a significant hearing loss.
- 3-15% for 80 - 85 dBA exposure
- 15-30% for 85 - 90 dBA exposure

# Hearing Protector Effectiveness

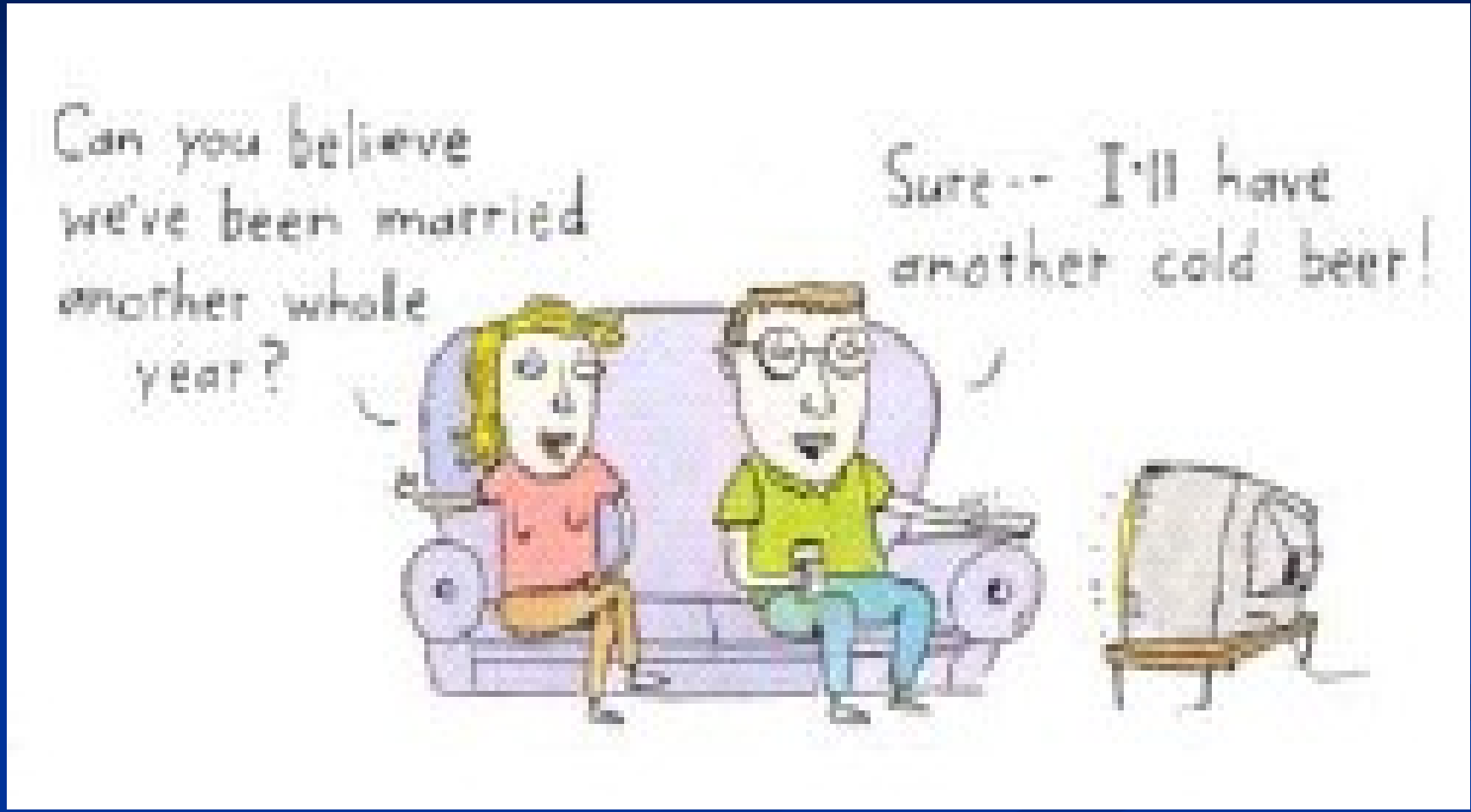



Reliance on HPD as the last line of defense can be tough when we don't know how they perform in the real world

# Stop Threshold Shifts…

# Start Training Sound…ly

# Effects of Noise on Hearing




Hearing loss sample

# Effects of Hearing Loss

- Group activities aren’t as enjoyable
- People “talk down” to the hearing impaired
- Added stress & fatigue
- Confusion & impatience
- Loss of self-confidence
- Less chance of promotion
- Family and work life disrupted

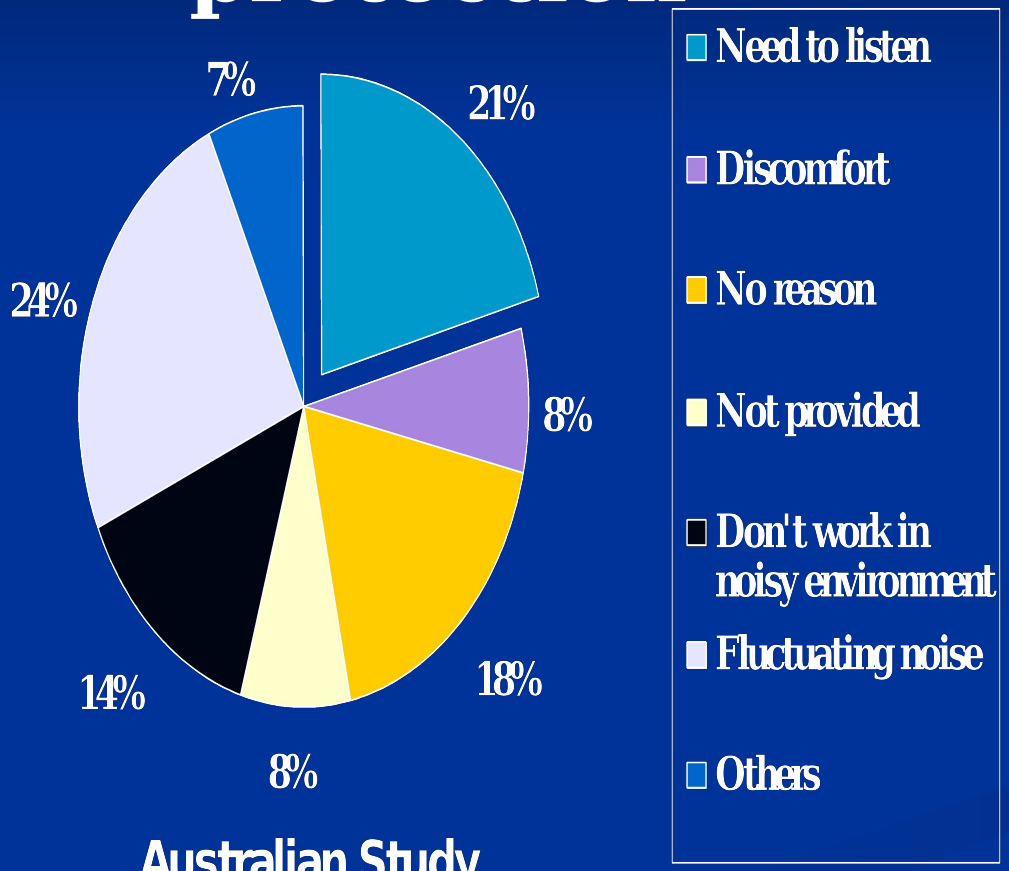
# Who Doesn't Use Hearing Protection?

- Younger workers
- Those with hearing loss
- Those who believe hearing aids can make up loss

# Barriers to Hearing Protection Use

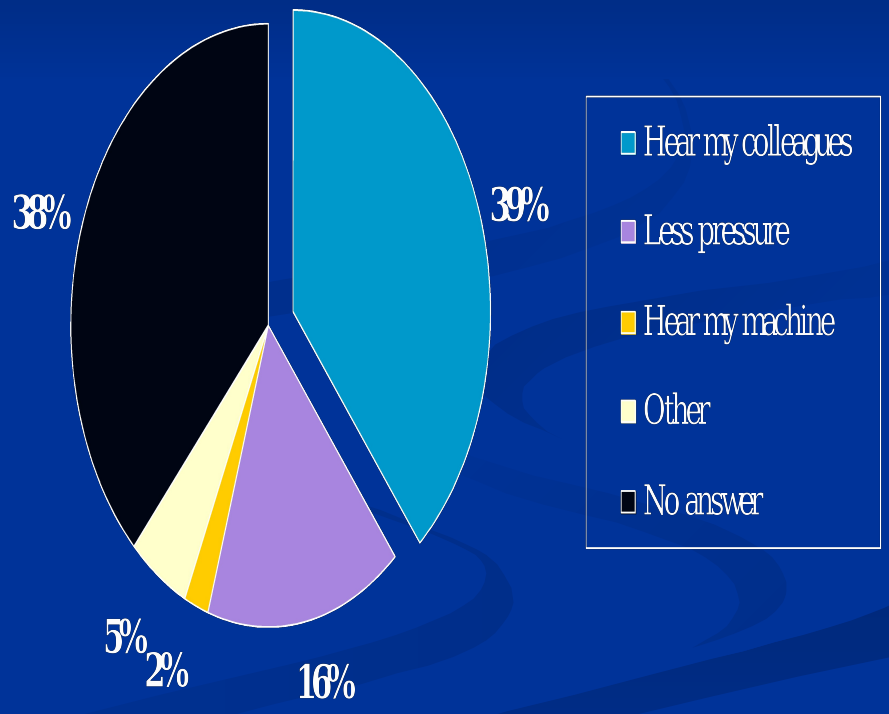
- Fear of not hearing warning signals & voices
- Uncomfortable to wear all day
- If I wear them “I’m not a tough guy”
- Benefit not readily apparent (hearing loss is gradual)
- More immediate hazards on job site

# Reasons for not wearing hearing protection




Australian Study

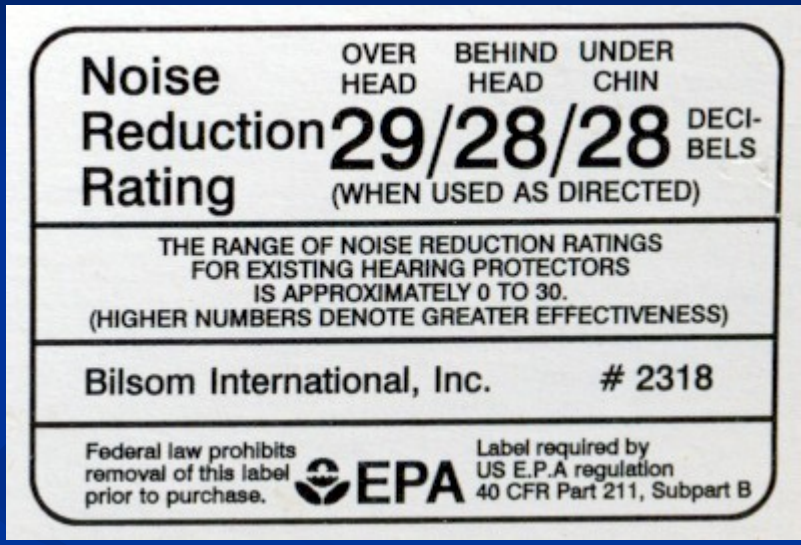
# Requested improvements




Danish Study

# Noise Reduction Rating

- All hearing protection devices have a NRR assigned


Noise Reduction Rating
OVER HEAD
BEHIND HEAD
UNDER CHIN
29/28/28
DECI-BELS
(WHEN USED AS DIRECTED)
THE RANGE OF NOISE REDUCTION RATINGS FOR EXISTING HEARING PROTECTORS IS APPROXIMATELY 0 TO 30.
(HIGHER NUMBERS DENOTE GREATER EFFECTIVENESS)
Bilsom International, Inc.
# 2318
Federal law prohibits removal of this label prior to purchase.
EPA
Label required by US E.P.A regulation 40 CFR Part 211, Subpart B

- NRR's do not accurately reflect attenuation in the real world

# NRR Calculations

- Subtract 7 dB from the NRR on the package
- Divide the resulting number by 2 (50% safety factor)
- Earplug with a NRR of 30 gives attenuation of about 11.5
  - 30 - 7 = 23/2 = 11.5 dBA
- If noise level were greater than 96 dB, probably not adequate

# NRR - the myth

- Bigger is NOT necessary better !!
  - If noise levels are in the high 80 dB to low 90 dB range be aware of overprotection.

| If the device reduces the noise to: | Than the protection is: |
|---|---|
| > 85 dB | Insufficient |
| 80 - 85 dB | Acceptable |
| 75 - 80 dB | Good |
| 70 - 75 dB | Acceptable |

# Hearing Protection Options

- Lower NRR plugs

NRR – 25 dB

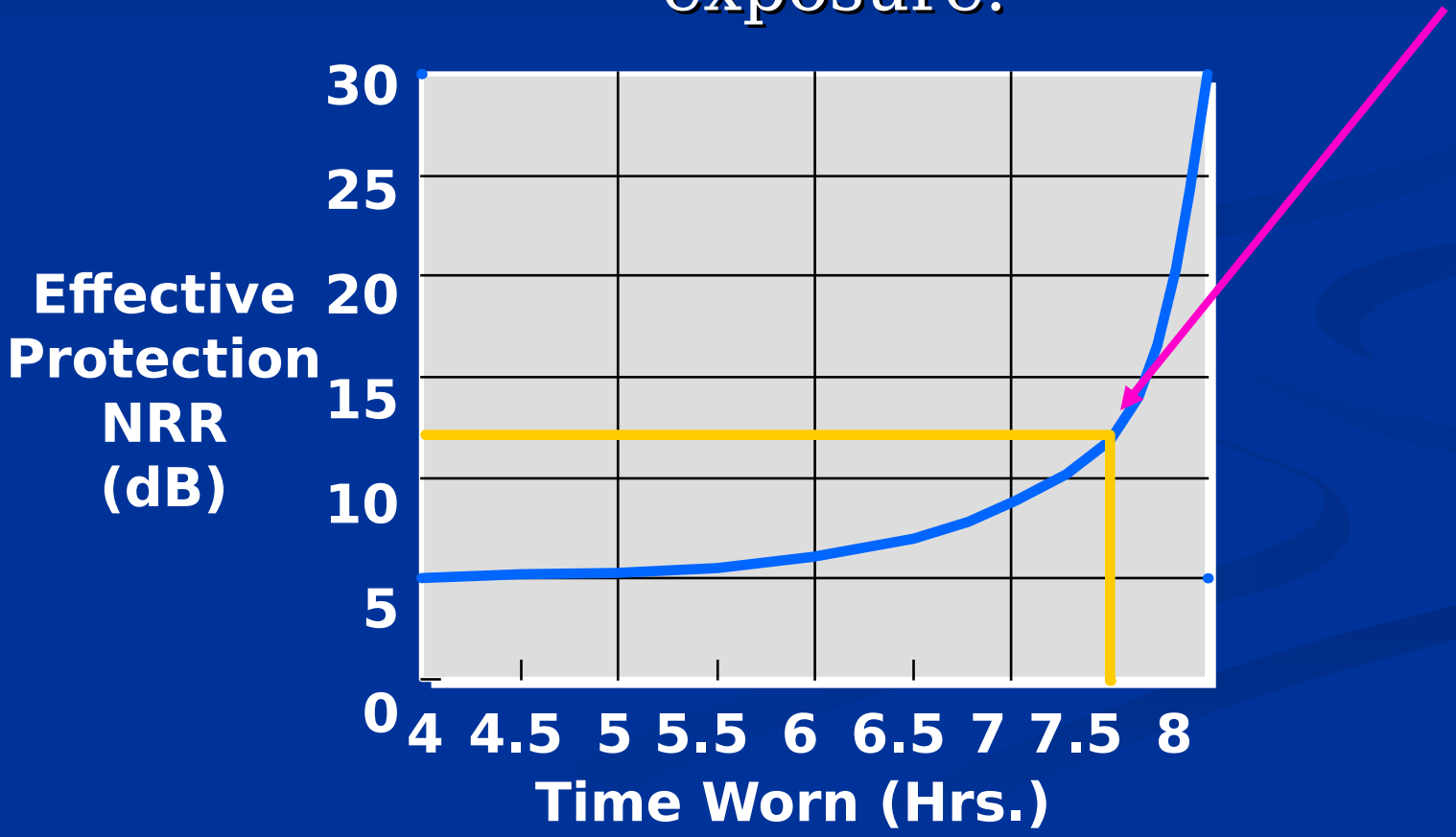
NRR – 28 dB

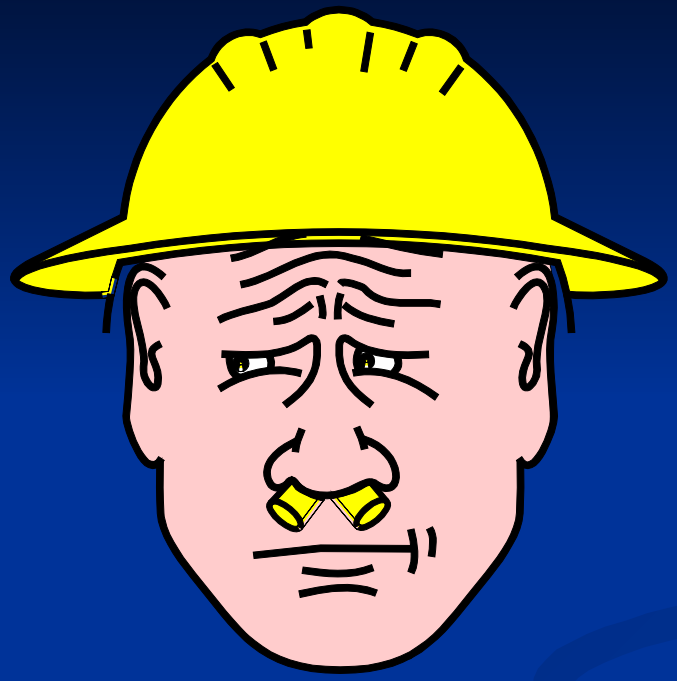
- Don’t need to be rolled, available with string , good for intermittent exposures
- Flat attenuating devices – use when communication ability is essential
- Communication headsets

NRR – 25 dB

# Wearing Time vs. Protection

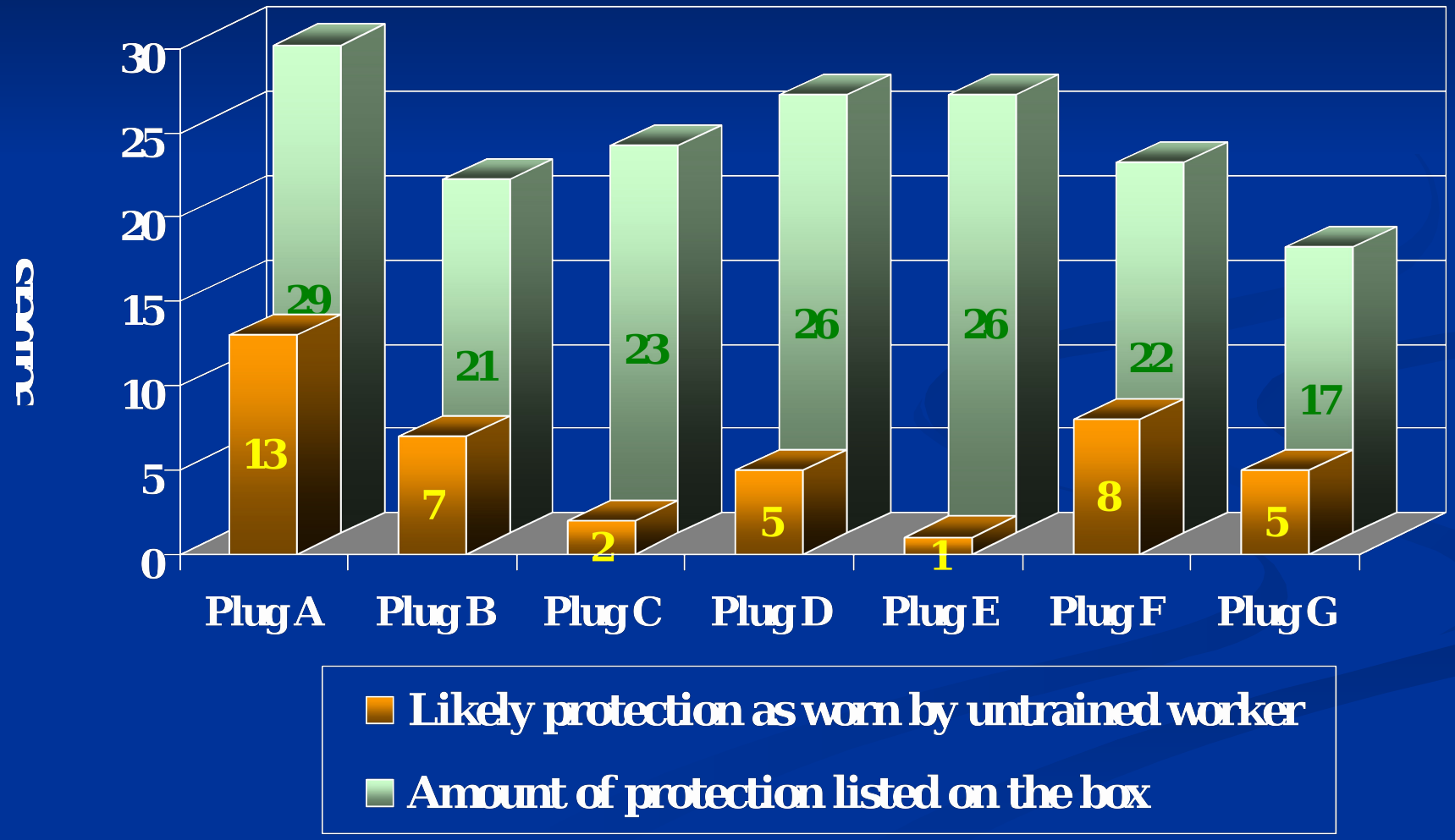
Less than HALF of the labeled Protection is provided if hearing protection is removed for thirty minutes during an eight hour noise exposure.



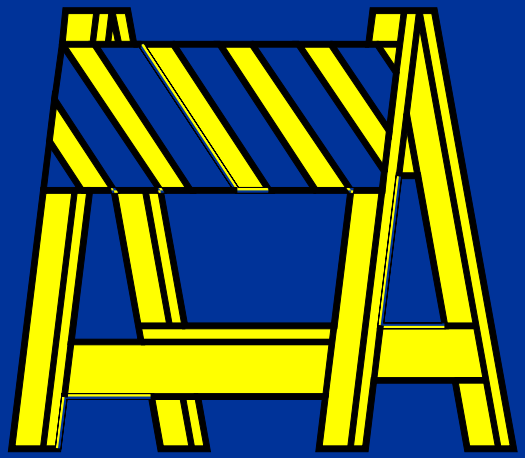


**Without proper training, any hearing protector that can be worn wrong, will be worn wrong!**

# Available protection vs. the amount of protection obtained by untrained workers.



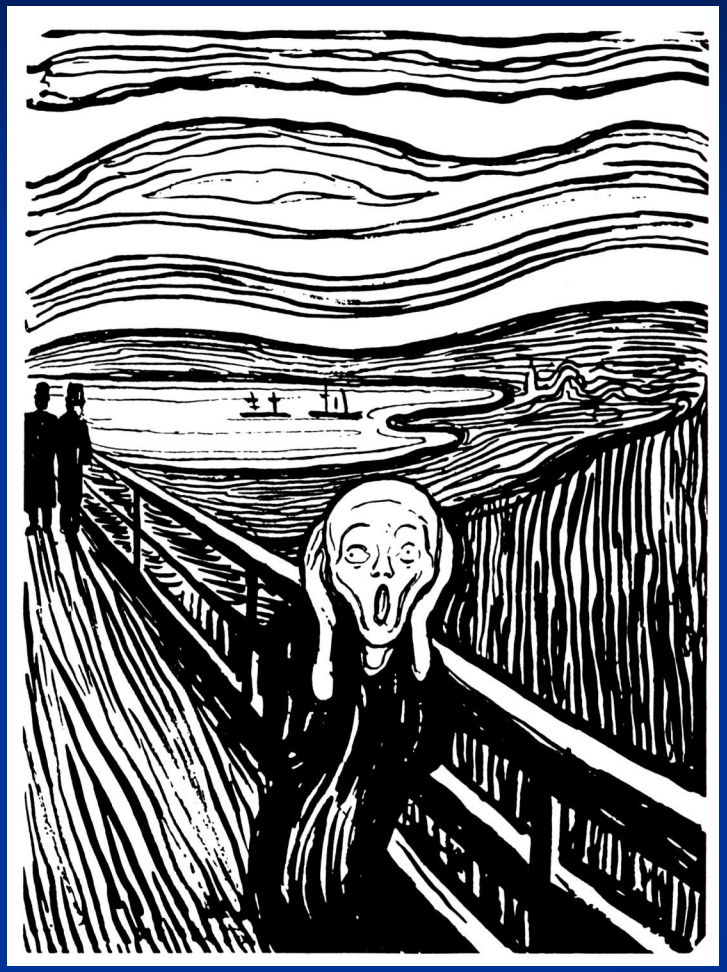
# Education and training must address two concepts:



**Remove Barriers**

**Develop Motivation**

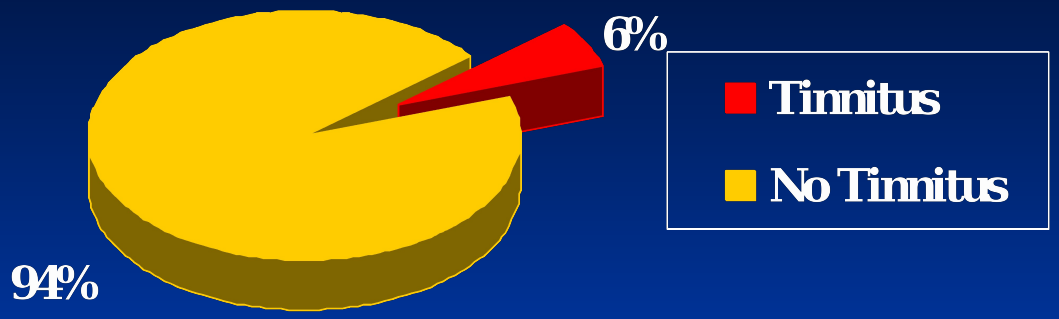
# Results of Focus Group



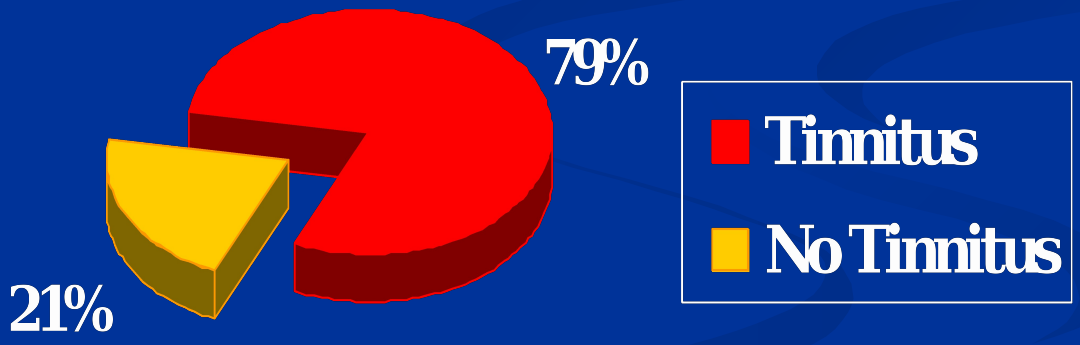
Workers may be less concerned about getting a hearing loss then abou developing tinnitus.

“I expected to lose my hearing. But, I thought it would be quiet.”

# Percent of People With Tin




**Non-Noise Exposed Worker**




**Noise Exposed Workers**

# What Really Motivates Use?

- Noise annoyance
- Fear of tinnitus (ringing in ears)
- Availability of ear plugs or muffs
- Social support - at work & home
- Peer pressure
- Change is more likely when people affected by problem are involved in its solution

# Family is Another Motivator

- Respirator use by painters driven by fear of

  chemical effects on reproduction

- Is same true for hearing your

  grandchildren?

- What is of VALUE ??

- Reinforce role hearing may pl
  protection of what is importar

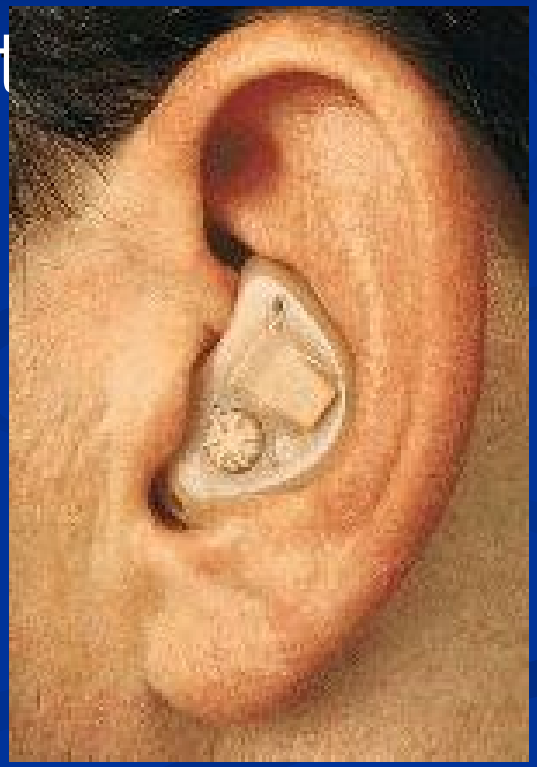
# Personal Experience

- Drive home with the radio on
- In the morning, is it too loud?
- Evidence of threshold shift – ears have recovered some overnight

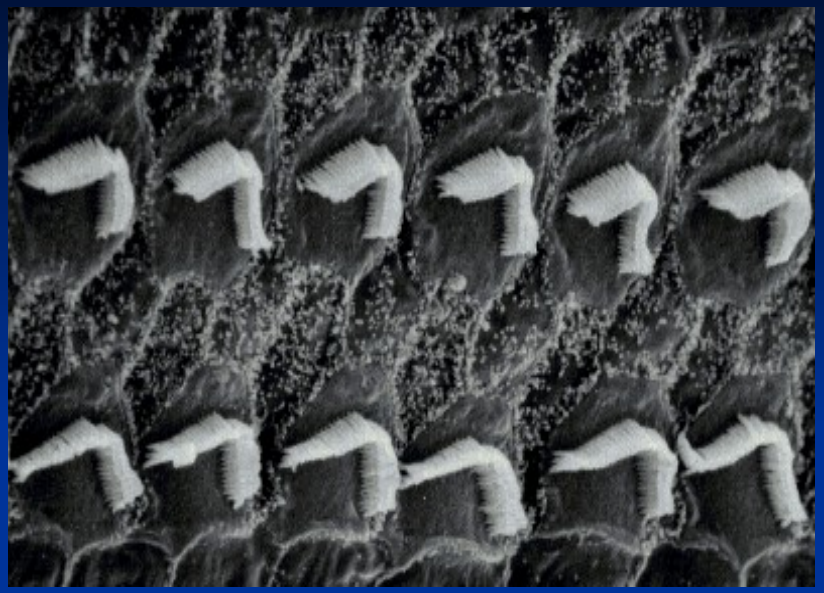
# It’s Really Pretty Simple…..

- **Wear this now**

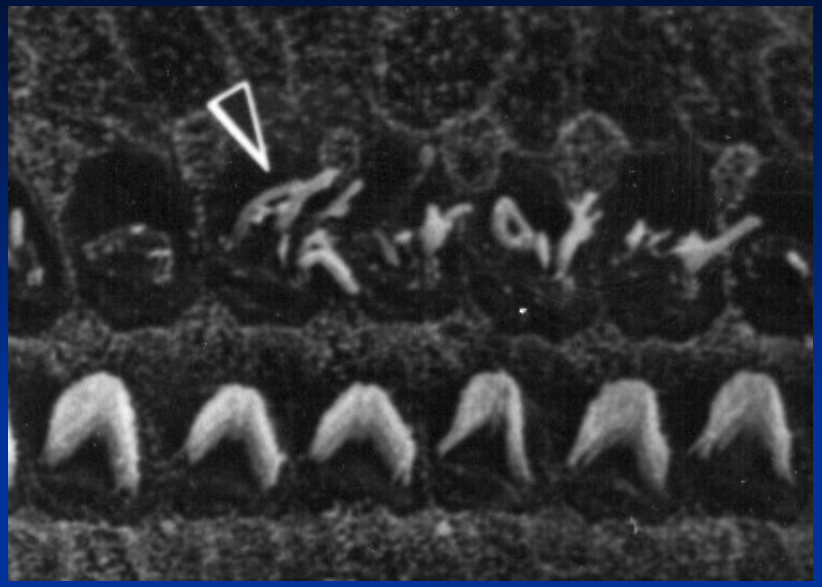
- **Or wear this lat**



Get their attention



This is your ear.



This is your ear on no

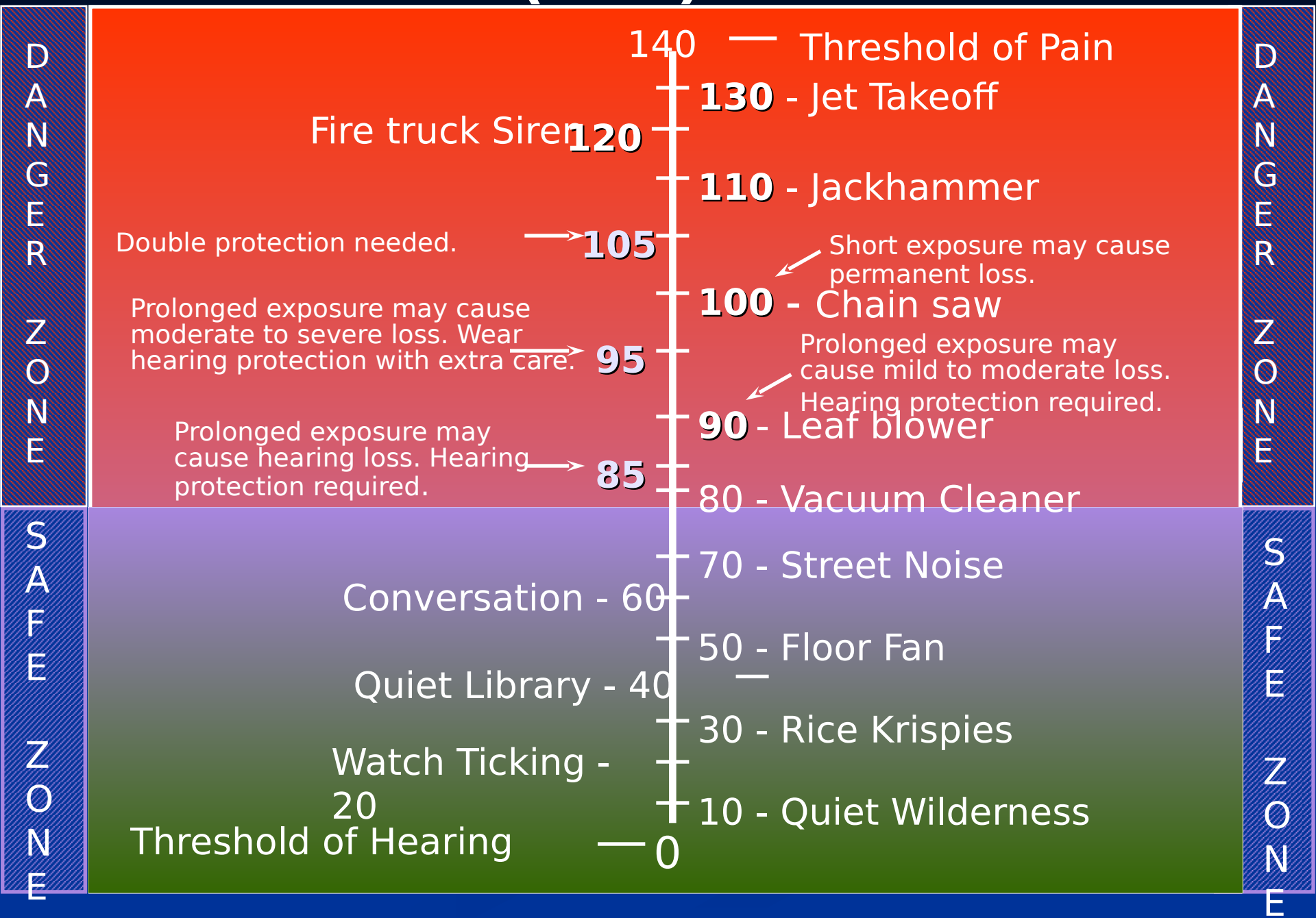
# Any questions?

Raise Awarene

# Noise Exposure Indicators

- Need to shout in order to be heard 3 feet away
  - sound levels probably approaching 85 dBA
- Ringing, buzzing or whistling immediately after a period of high noise exposure
- Equipment is tagged or marked

# Decibels (dBA) and Risk


DANGER ZONE
SAFE ZONE
140 — Threshold of Pain
130 - Jet Takeoff
Fire truck Siren
120
110 - Jackhammer
Double protection needed.
105
Short exposure may cause permanent loss.
100 - Chain saw
Prolonged exposure may cause moderate to severe loss. Wear hearing protection with extra care.
95
Prolonged exposure may cause mild to moderate loss. Hearing protection required.
90 - Leaf blower
Prolonged exposure may cause hearing loss. Hearing protection required.
85
80 - Vacuum Cleaner
70 - Street Noise
Conversation - 60
50 - Floor Fan
Quiet Library - 40 —
30 - Rice Krispies
Watch Ticking - 20
10 - Quiet Wilderness
Threshold of Hearing — 0

# Send something home with them…

- About 400,000 children have NIHL - this includes kids as young as 9.
- The incidence of NIHL among 8th graders has tripled in the last 10 years.
- Up to 90% of 10-12 year olds own and use personal stereos with outputs which exceed 115 dB.

# Noise & Chemical Exposures

- Exposures to solvents and noise result in up to 4 times greater risk of HL than with noise alone
- Solvents - toluene, xylene, styrene and trichloroethylene
- Gases - carbon monoxide, hydrogen cyanide and low oxygen levels
- Heavy metals - lead, mercury and arsenic

# Hearing aids are not hearing protection

- Hearing aids are NOT hearing protection!
- When hearing aid users are exposed to harmful levels of noise they should:
  - Remove their hearing aids and use hearing protection or
  - Turn off their hearing aids and put ear muffs on over them
  - Sample hearing protection options
    - ***E·A·R® ULTRA 9000® Earmuff***
    - ***E·A·R® UltraTech® Earplug***

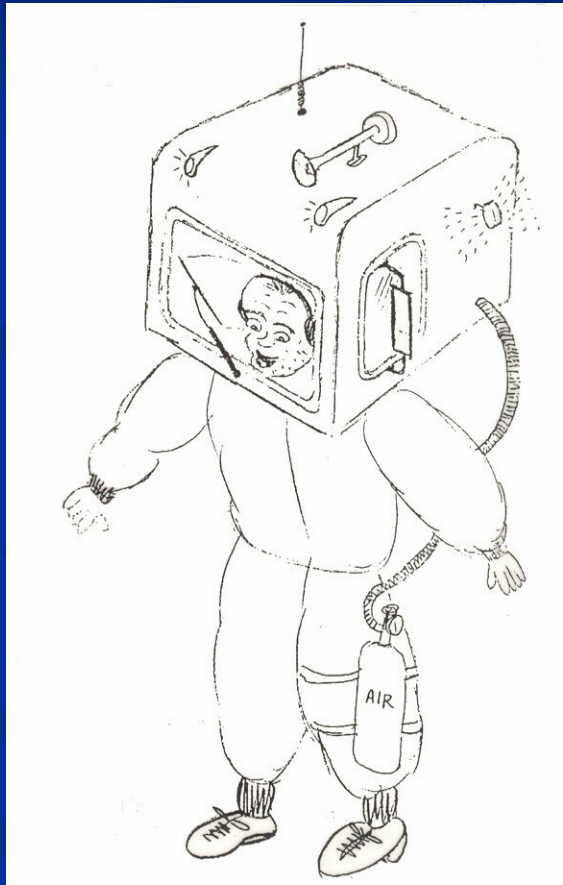
# Personal Headset Stereos

Do not provide protection from noise.

Can easily exceed 90 decibels.

# Noise Engineering Controls

"Easy Fixes"



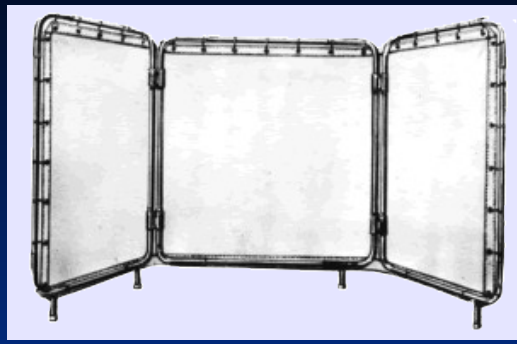
# Source Identification

- Mechanical impacts
- Air exhausts
- Air flow over surfaces
- Vibrating surfaces
  - Pipe Radiated Noise

# Noise Control - Maintenance

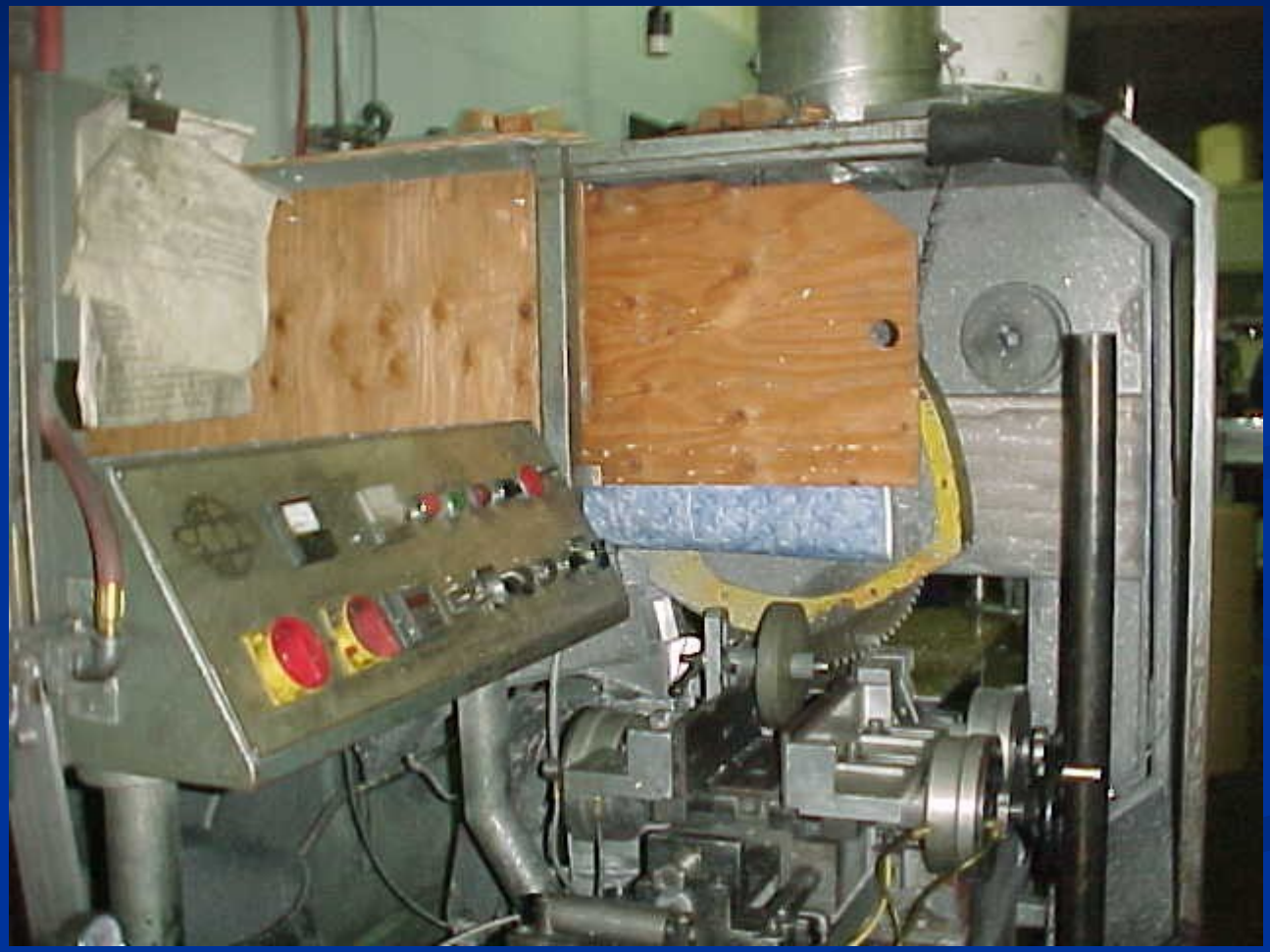
- Maintenance problems can cause 5 - 15 dB increase in noise levels
  - worn components
  - loose parts
  - poor lubrication
  - imbalances
  - obstructed airways
  - blunt cutting surfaces
  - damaged/removed silencing equipment

# "Easy Fixes" – Barriers / Enclosures



- Prevents sound from traveling
- Best with high frequency sound
- Use cardboard or plywood to demonstrate
  - can get 5-10 dB reduction with just cardboard
- Use Lexan instead of open guards
- Cover metal surfaces with a coating, cloth, pad or blanket to reduce impact noise

# Noise Solutions - Enclosures



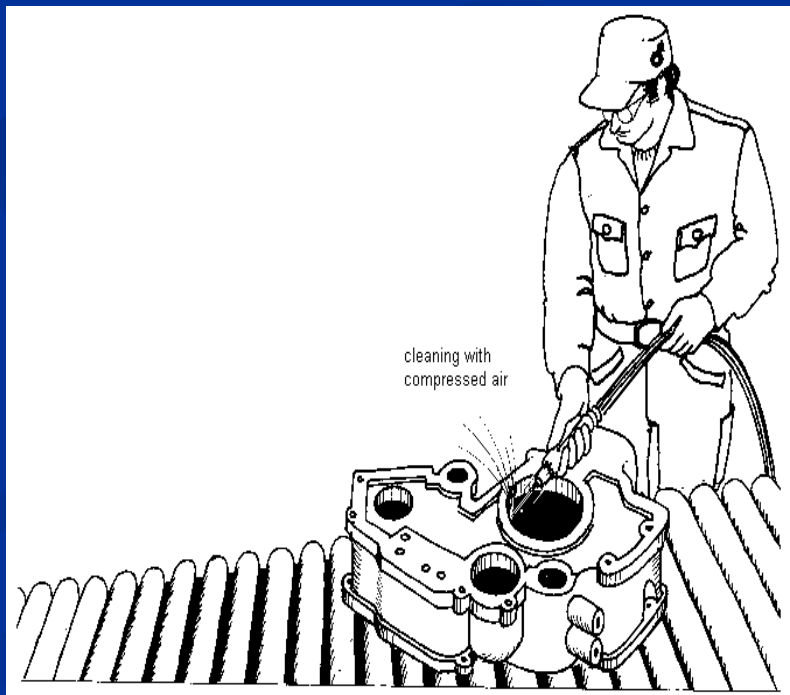
# Noise Solutions - Barriers

# “Easy Fixes” - Enclosures

- Equipment cabs
  - Keep driver from equipment noise
    - Open bulldozer is on average 6 dB higher than a closed bulldozer
    - Glassed in cranes are on average 10 dB lower than non-enclosed
  - Make sure exhaust is piped away from cab
  - Add materials inside to prevent noise “leakage”

# “Easy Fixes” - Compressed Air

- Decrease air pressure
  - 5-15 dB reduction
- Quiet air nozzles
  - 10 - 30 dB reduction
- Air exhausts
  - Mufflers
  - Pipe air away



# Buy Quiet Policy

- Purchasing & Contracting
  - Purchase quieter equipment
    - specify in contracts for new equipment that low noise & vibration levels are desired
  - Specify in contracts with prime or subcontractors that low noise practices will be incorporated into the job when feasible

# Reference Materials

Aearo EARLog Notes
www.aearo.com/html/industrial/earlog.htm

NIOSH - Industrial Noise Control Manual
www.cdc.gov/niosh/79-117pd.html

Noise Control - A Guide for Workers and Employers
www.nonoise.org/hearing/noisecon/noisecon.htm

Australian HS Commission - Practical Solutions Database
http://www.nohsc.gov.au/OHSInformation/Databases/OHSSolutions/ohssolutions.htm

# Reference Materials

"Quiet" Compressed air nozzles & silencers

www.silvent.com

www.guardaircorp.com

Health & Safety Executive – Noise control page

http://www.hse.gov.uk/pubns/noisindx.htm

Heavy Equipment / Mine operations – MSHA information

www.msha.gov/1999noise/noise.htm

# Reference Materials

Link to the Hearing Loss Sampler and lots of other stuff
http://facstaff.uww.edu/bradleys/ohc/